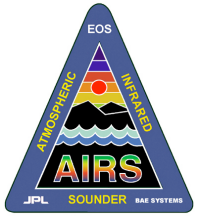
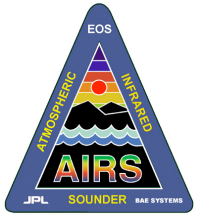


AIRS In-flight Spectral Calibration

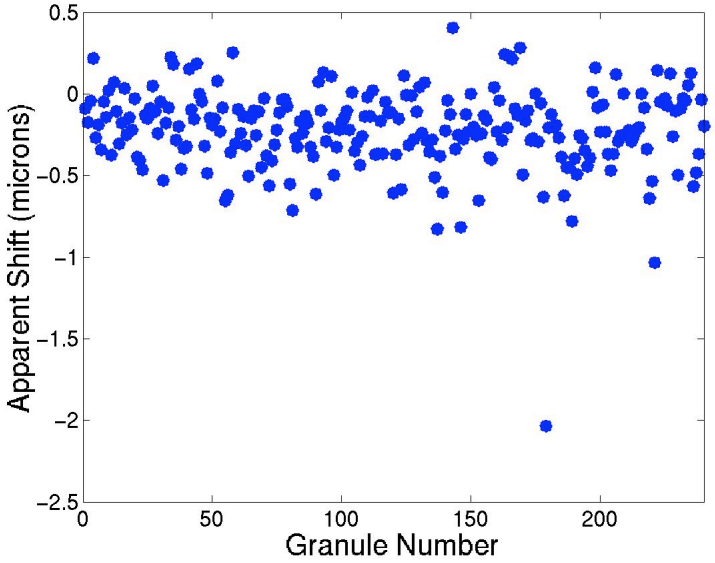
Steve Gaiser

Introduction



- **Spectral calibration is important**
  - **It's a basic need of any spectrometer.**
  - **It is used explicitly by the AIRS forward models.**
  - **1% □□ centroid errors (a 1 □m focal plane position error) can cause radiometric errors of up to 0.4K.**
- **Approach summary**
  - **Simulated radiances were created at multiple frequency sets (each corresponding to a different shift of the focal plane), oversampling the AIRS detectors' spacing.**
  - **Observed radiances are averaged, and narrow spectral bands (called "features") are correlated against the different simulated radiance sets. A best fit shift is determined for each feature.**
  - **Individual feature shifts are combined to determine the best fit focal plane position.**

Results Summary



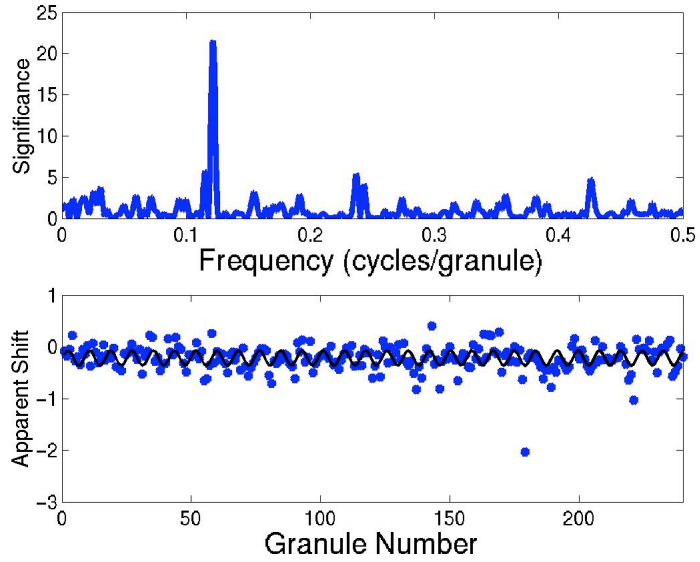
- **Used Fishbein simulation of Dec. 14, 2000 (240 granules)**
- **No failures**
- **Mean = -0.22 microns**
- **Stddev = 0.25 microns**
- **Requirements satisfied**

TGRS Paper Cross-references

- **Strow et al.**
  - Frequency errors are channel dependent.
  - The nominal AIRS spectrometer model is within 0.0005 * □□ of the true frequencies for all channels.
  - Uncertainties in the array positions are the biggest source of error in the AIRS spectrometer model.
  - Uncertainty in the SRF shapes (including fringes and other effects) introduces an error in reference radiance spectra equivalent to a centroid error of less than 0.0002 * □□.
- **McMillin et al.**
  - Spectral stability for periods of the order a month are required for tuning.
- **Fishbein et al.**
  - Simulation based in part on NCEP forecasts for that day. (ref dropped; oops!)

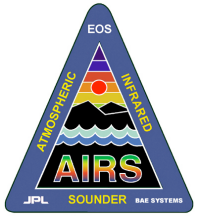
Periodicity Analysis

Periodicity of one day's shifts



- **Individual features show power at orbital, semi-orbital, and quarter-orbital periods.**
- **Semi-orbital variations usually dominate.**
- **0.30 micron peak-to-peak variation is best fit to dominant period for this day**

Conclusions



- **Based on simulation results, the current algorithm satisfies requirements.**
- **Additional improvements are possible if [when] real data prove more difficult:**
  - **Include multiple climatologies (reference spectra for multiple atmospheric profiles).**
  - **Weigh features according to the number of footprints averaged**